Photorealism, Nostalgia, and Style. Material Properties of Film in Digital Visual Effects

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MATERIAL PROPERTIES OF FILM IN DIGITAL VISUAL EFFECTS

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With the introduction of smartphone apps such as Hipstamatic (2009) and Instagram (2010), the rendition of instant snapshots in the style of old photographs has recently spread in amateur photography. These apps recast even the most mundane scenes in a lovingly nostalgic light, giving them a romantic touch and evoking memories of family albums packed with faded pictures from a time before the 'digital natives' were even born.

In fact, the popularity of these apps turned a strategy for the production of professional visual effects into a tool of mass entertainment. Starting in the 1990s, computer scientists began to develop algorithms to enhance sterile and naked-looking computer-generated imagery with material properties initiating those that could have emanated from either the photographic apparatus or the photochemical stock, such as motion blur, depth of field, film grain, scratches and dirt. These simulations of analogue artefacts were more than embellishments of early renderings. Connecting these images to the long-established traditions of photography and film meant they became a cornerstone of the now-established concept of 'photorealism' in computer graphics and animation. Only in recent years, however, has CGI acquired such a high degree of sophistication that it has become barely distinguishable from imagery captured with an analogue or digital camera.

From the 1990s on, there has been a growing tendency to showcase these artefacts to the point of exaggeration, not only evoking the loving memories of faded photographs, but also commenting on them in an ironic fashion. One of the most striking examples in this vein is Baz Luhrmann's *Moulin Rouge!* (2001), which depicts turn-of-the-century Paris in the style of Georges Méliès' silent films, combined with the frantic movement and speed of a virtual camera that rushes through the narrow streets, and other stylistic properties of contemporary filmmaking; Luhrmann termed this combination 'artificial reality'.[1] There is a tension in the computer-generated imagery of the 2000s between achieving a higher degree of photorealism by appropriating the cultural rules and mechanical properties of photography and at the same time marking these images as utterly artificial through a stylised rendition of such distortions.

This article draws upon my analyses of this phenomenon in two earlier texts.[2] It starts with an investigation of a variety of the most common analogue artefacts added computationally to CGI and digital compositing. Based on this primary description, I will then develop a functional typology to describe and analyse different strands of their uses and functions in movies. Finally, I will contextualise these findings in a broader cultural discourse surrounding the concepts of nostalgia, postmodernism, pastiche and authenticity.

There is, however, an urgent need to clarify one of the most important issues when we talk about digital images, namely that there is no such thing as *the* digital image, but only a variety

Moulin Rouge! (2001): Baz Luhrmann's artificial reality

thereof. Between a computer-generated image and an image captured with a digital camera, there is a fundamental difference with regard to their technical and epistemological foundations and aesthetics. While CGI has to be built from scratch based on mathematical models or on image data collected in the real world, digital photography stands by definition in the tradition of its analogue predecessor and shares with it more common features than it does with CGI. In contrast to digital photographs, computer-generated imagery struggles to achieve full photorealism. A further variety of digital imagery is compositing that combines images from various sources into a seamless or even heterogeneous-looking whole. With the latest developments in image-based techniques and even more so with computational photography,[3] the gap between CGI and digital photography is becoming more and more irrelevant. Still, it remains necessary to keep the different evolutionary, epistemological and aesthetic strands in mind when we discuss phenomena and problems associated with digital images.[4] Most of the imprecision in studies of digital images stems from the overlap of different concepts in the genesis and critique of digital images. In this essay, I will focus on the combination of CGI with live-action footage in digital visual effects.

Since William J. T. Mitchell's diagnosis of a post-photographic era there has been a mostly dystopic discussion of digital image processing, frequently explained in terms of forgery and manipulation.[5] However, there is a notable difference between the covert manipulation of a documentary image and a computer-generated or processed image as part of a movie's fictional world. Therefore, we should embed the discussion in a contextual field defined by institutional and cultural factors.

Photorealism and Analogue Artefacts

In his observations on the use of blurred images in historical and contemporary photography, Wolfgang Ullrich reports an early experiment by art historian Charles H. Caffin to evaluate the impression of reality in photographs.[6] In this experiment, performed with people who were not accustomed to perceiving photographs, Edward Steichen's photo entitled 'The Pond' was deemed the most realistic one.

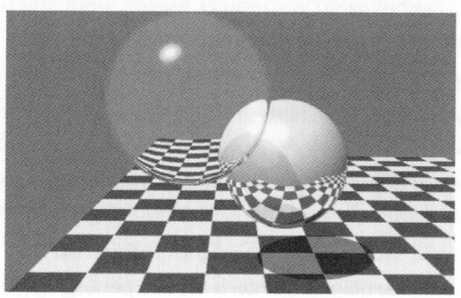
This is surprising because Steichen's photo is a typical example of the pictorialism that emerged in the early twentieth century to establish an artful and painterly style in photography.

'The Pond – Moonlight', Edward Steichen, 1904

Furthermore, it is processed in a three-colour technique that applies layered bichromate gums in different colours during printing, and contains a fair amount of optical diffusion. Instead of being a direct record of the scene in front of the camera, this photograph transforms its subject significantly. It renders a mood and an atmosphere rather than a detailed depiction. In opposition to this atmospheric style in photography, an early rendering in computer graphics, such as the first example of raytracing by its inventor Turner Whitted in 1980, evokes a rather different impression but, at the time of its introduction, it was considered photoreal.[7]

While it certainly shares some aspects with a photographic image, we would hardly agree any more that this image is photoreal, because it lacks features found in the real world. The refraction in the glass sphere looks too clean; the shadow is sharp, but grey, due to the ambient term in the Phong shader.[8] In sum, the lighting situation doesn't seem very natural since there are no indirect reflections, no refractions and no caustics.[9] Apart from these features, which we can attribute to the very limited calculation of physical properties of light propagation in early computer graphics, we also notice a lack of depth-of-field. As a result, the image looks too sharp and sterile.

From this comparison we can conclude that photorealism is a highly debatable and historically variable concept. In the theories of representation proffered by philosophers such as Nelson Goodman,[10] Max Black, Noël Carroll and others, it is not granted – as realists such as André Bazin, Roland Barthes or Siegfried Kracauer have suggested – that the basic photographic or cinematographic apparatus automatically provides a faithful representation of the real. In order to explore and fully understand this mode of representation we have to explore the basic assumptions already present in this apparatus. These assumptions are themselves rooted in insights from psycho-physics into the physiology and processing of human perception as performed in the nineteenth century by Thomas Young, Gustav Theodor Fechner, Johannes von Müller or Hermann von Helmholtz. In addition to this bias already present in the theoretical underpinnings of the technological apparatus, there is a culturally determined variability associated with notions of style and fashion that influences the concept of (photo)realism. These surrounding elements establish certain conventions that inform our perception of any depiction in a given historical moment in a certain culture. It is always our contemporary mode of depiction that seems the most transparent to us, as Nelson



Raytracing by Turner Whitted

Goodman has pointed out in his reflections on the ideological influences on any form of representation: 'Realism is relative, determined by the system of representation standard for a given culture or person at a given time. ... This relativity is obscured by our tendency to omit specifying a frame of reference when it is our own.'[11]

Grain, Scratches, Dust and Noise

In conjunction with cultural influences on contemporary styles, one of the most important factors in the formation of conventions are technical limitations and choices made in the production of films. Throughout the history of film, the photochemical composition of film stock has been a major influence on the look of filmed images. While there have been shifting preferences and tolerances in the sensitivity and contrast rendition of film stocks, especially in the domain of black-and-white film and to a lesser degree in the chromogenic multilayered colour film stock that has proliferated since the 1950s, one of the most typical elements in the aesthetics of film has been its grain, produced by the silver halide crystals present in the filmic emulsion. In contrast to the fixed orthogonal pattern provided by the pixels in a digital image, this grain is randomly distributed. In projection this produces a pseudo-movement from frame to frame, and these micro-movements designate the temporality of the film; even if we watch a still image recorded on film, the movement of the grain evidences its temporal unfolding.

Furthermore, the grain endows the surface of the film with a specific texture that we associate with the cinematic. Thus the grain is attributed with something like the essence of the filmic experience, as expressed by cinematographer Janusz Kaminski:

> To me, movies are a social event ... . They don't necessarily help us escape reality, but they offer us a reality that is different from what we see at home. If you can't see or sense grain in the image, you're not experiencing the magic of movies.[12]

Many contemporary film-makers and cinematographers choose a stock or a processing that enhances the graininess of the film, while suppliers of stock have constantly evolved it to produce ever-finer grain, even to the point where it is hardly noticeable due to the T-Grain introduced in modern Kodak stocks.[13] Kaminski, for example shot on the super-sensitive Kodak Vision 800T and applied the so-called bleach-bypass process to *Minority Report* (2002), enhancing the dark atmosphere of the film's dystopic vision with a gritty-grainy effect.[14]

Heavily visible grain, preferably in connection with black-and-white or sepia-toned cinematography, has become a marker of historicity in films, either to denote an earlier period in the narration or the memory of a character in a flashback. In films that combine historical footage with CGI or live action in compositing, as in *Forrest Gump* (1994), the grain has to be added evenly to the new elements to grant aesthetic coherence. To achieve this effect – which was first applied digitally in Woody Allen's *Zelig* (1983), albeit only to still images – one has first to filter the grain out of the original footage, only to add it again after the compositing is completed. Similar aesthetic effects can be found in the works of Guy Maddin or in the Swiss production *Terra Incognita* (2004).

Like grain, scratches and dust are directly associated with the materiality of the film stock: as markers of its repeated use, they communicate the age of the material. In the opening

Grain in *Terra Incognita* (2004)

sequence of *The Curious Case of Benjamin Button* (2008) we are presented with the story of a clockmaker who – after he lost his son in the war – constructs a clock that runs backwards. This short allegorical episode is enhanced by scratches, dirt, diffusion and a seemingly historical colour scheme. This strategy has a long-standing tradition. Seventy years earlier, in Orson Welles's *Citizen Kane* (1941), scratches marked a staged newsreel entitled *News on the March* that summarised Kane's life. Even the unstable handling of the camera mimicked the perspective of a clandestine paparazzo who had shot some footage from behind a fence with the camera on his shoulder. In Michel Gondry's *Be Kind, Rewind* (2008), such fake footage is shot with a VHS camera in front of which a fan produces the flicker and real threads add the scratches to the low-resolution video when the protagonists stage the life of a famous former member of their neighbourhood, musician Fats Waller. In her reflections on 'cinephilia without film', Caetlin Benson-Allott describes scratches added to the HD digital video as a 'new mode of digital nostalgia' in a 'transhistorical, simulacral moment' that marks the universe of *Grindhouse* (2007) by Robert Rodriguez and Quentin Tarantino.[15] Both *Be Kind, Rewind* and *Grindhouse* are similar instances of a low-tech approach to the rendition of film's historical past, located somewhere between parody and sincere homage.

Another genre to enlist simulated scratches and noise is the fake documentary or 'mockumentary'. These films often formulate a critical stance toward documentaries by provoking a vigilant mode of perception in the viewer. The ambiguous status of these films will be the topic of the final two sections of this essay. Many of them apply traces of wear and tear, such as scratches and dirt, as in *Zelig*. More recently, Neill Blomkamp's *District 9* (2009), a mockumentary about a slum in South Africa populated by aliens, featured footage with a worn-out

look, fraught with evidence of use and degraded by poor resolution. By referencing different kinds of materials, ostensibly produced by embedded journalists who give a firsthand account of the wretched situation of the aliens at the borders of civil society, he establishes a web of allusions to media representations.

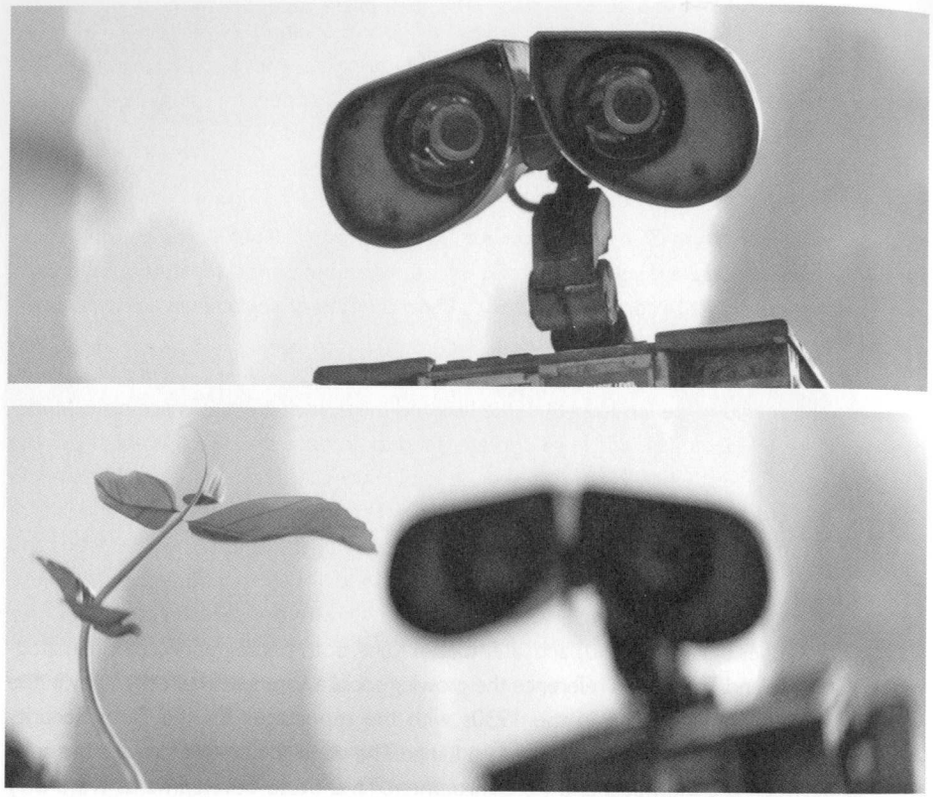
Depth-of-field

With the virtual camera in CGI, no lens configuration transforms the profilmic scene in the rendering process, so there are several optical effects that can be applied separately, either by a camera shader or in post-processing.[16] One of them is depth-of-field, others are lens distortion, chromatic aberration, lens flare or vignetting.

In practical photography – both analogue and digital – depth-of-field is intrinsically connected to the aperture, the focal length of the lens and the diameter of the image plane. Wide-open aperture, telephoto lens and large diameter tend to produce shallow depth-of-field. From the perspective of aesthetics there have been several historical periods where either shallow depth-of-field or deep focus were fashionable. In early film, with its frontal staging and lack of montage, deep focus was necessary to depict the whole image space. In the later teens and especially from the mid-1920s on we can notice a trend towards shallow depth-of-field. Famously, this development was inverted in the late 1930s with the deep-focus style of films such as *The Grapes of Wrath* (1940) and later *Citizen Kane*, both photographed by cinematographer Gregg Toland. These films reference the growing social awareness in photography in the wake of the economic decline in the 1930s with the reportages for the Farm Security Administration by Walker Evans or Dorothea Lange. The deep-focus style stresses the relationship between the individual and his environment. Thus these developments were only partly the result of technical limitations such as the low speed of early film stock. My own investigations have shown that cultural movements had a bigger impact, not least for the development and implementation of certain technological advancements.

In CGI, however, it was impossible until the late 1990s to even render depth-of-field (DOF), because it requires not only the blurring of certain parts of the image, but a systematic relationship between focus and depth. Moreover, DOF is not only a critical issue in CGI but also in compositing where, since the different elements are initially shot or rendered in focus, the compositors have to carefully establish a relationship between the different image planes and their rendition of focus.

In his standard textbook *The Art and Science of Digital Compositing*, Ron Brinkmann shows an important difference between the photographic quality of out-of-focus areas – called bokeh – and a simple Gaussian blur, that is, the computational averaging of adjacent pixels according to Gaussian distribution.[17] Bokeh refers to a pleasing quality of the out-of-focus area where, due to spherical aberration, the circles of confusion create shiny spots of light. Many lens manufacturers take great care in designing their lenses to deliver beautiful bokeh. As Brinkmann points out, there are digital tools to render bokeh but they are still seldom applied. For *Wall-E* (2008), the producers consulted with cinematographer Roger Deakins, who taught the CGI professionals how to successfully convey the impression of DOF and how to apply it sensibly both with regard to narration and style. In fact, Deakins's lessons pay off visibly in *Wall-E*. Not only does the application of DOF enhance the photographic quality of the renderings, but it

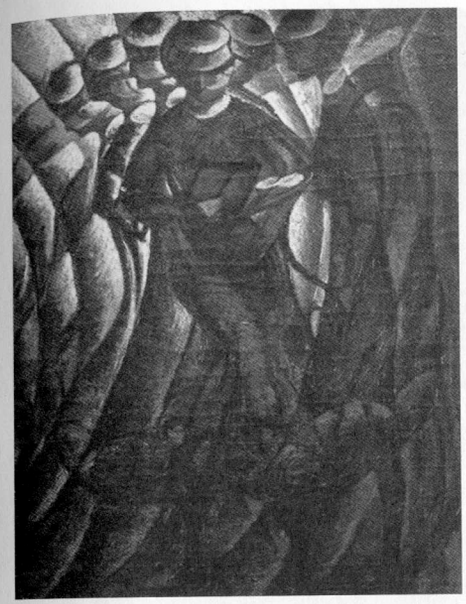


Rack focus in *Wall-E* (2008)

makes it appear organic and convincing, with objects out of focus acquiring a transparent quality with a pleasingly glowing translucent effect. Even rack focus is engaged as a means of storytelling, for instance in a scene when the robot protagonist discovers the last plant on earth. Rack focus operates to align the spectator with the heightened attention *Wall-E* bestows on his discovery. Rack focus, then, is a further strategy engaged to transform the visual space by optical means and to use depth-of-field to shape the point-of-view structure of the narrative.

Motion Blur

In his reflections on filmic artefacts in digital video, Stephen Prince states that 'film has motion blur, video does not'.[18] In fact, the situation is a bit more complex. In video we must distinguish between two modes, one being the *interlace mode*, whereby the even and odd lines of an image are generated alternately, a technique that dates back to analogue electronic video; and the *progressive mode*, whereby full frames are captured as on film. In the most recent generation of digital video cameras, the CMOS (complementary metal-oxide superconductor) sensors apply a third kind of movement artefact connected to the rolling shutter, which moves vertically from top to bottom. In the progressive mode, there is no visible difference in the production of motion blur of digital video compared to film. This mode was introduced to HD video in the early 2000s to generate a 'film look'.



'Plastic Synthesis of Movements of a Woman', Luigi Russolo, 1911

In CGI, on the other hand, there is no motion blur at all. Like depth-of-field, motion blur is an artefact that has to be assigned arbitrarily to the images, ideally in conjunction with an evaluation of both the camera's and the object's movements. Motion blur is, in addition to grain, probably the most typical artefact of film recording. Classical stop-motion animation therefore had a different quality because it lacked motion blur. Only when go motion was introduced in the 1970s could motion blur be integrated into stop-motion animation.

In the history of art, a form of motion blur was introduced in Italian futurism of the 1910s, for instance in a painting by Luigi Russolo. The Italian futurists were concerned with depicting modern urban life, and were especially fascinated by its dynamics. They adopted a mode of representation which was connected to the emergence of cinema, in that they mimicked the sequential unfolding of still images. Thus motion blur had already been used to express speed and dynamics early in the twentieth century. Also, the German painter Gerhard Richter incorporated many analogue artefacts into his photorealist paintings – especially the portraits – to reflect the differences between painting and photographic images. In combination with depth-of-field, motion blur was one of the most pervasive of these artefacts in Richter's work. In visual effects, this tradition has been resurrected, for instance in some shots of *The Matrix* (1999) to depict the extreme agility of the virtual agents.

The situation is somewhat different in *Fight Club* (1999), where another traditional strand of motion blur can be observed. In late nineteenth-century photography, motion-blurred

Superhuman speed in *The Matrix* (1999)

Motion blur in *Fight Club* (1999)

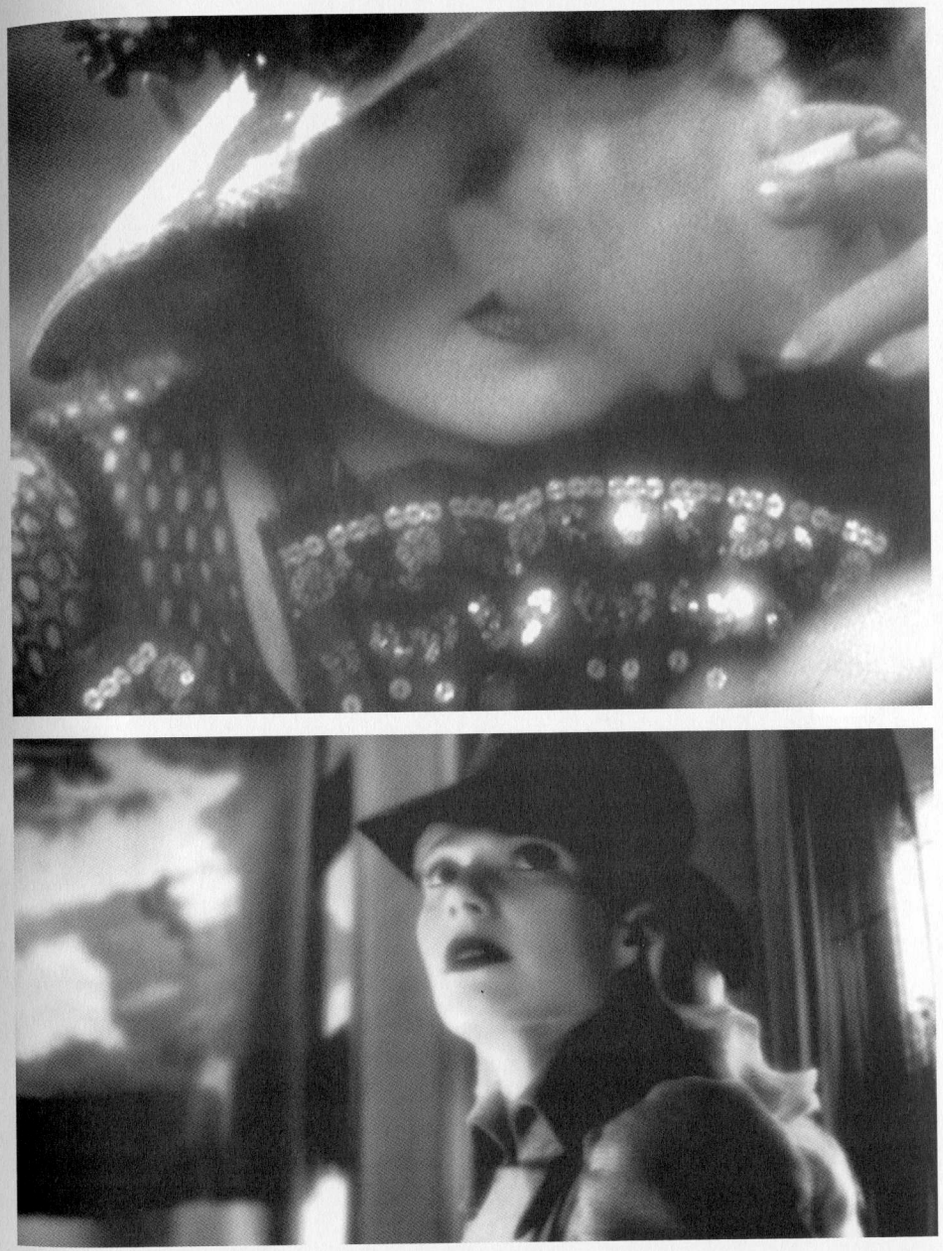
images were connected to ghostly apparitions. The sex scene with Marla Singer (Helena Bonham Carter) refers to this mode and generates a dreamlike quality. A similar use of extreme motion blur was implemented in *What Dreams May Come* (1998), where it alludes directly to the iconographic tradition of ghost images. In many images, figures and objects are subject to such a high degree of motion blur that their contours are completely dissolved in blurred, painterly lines associated with the brush strokes of the protagonist's wife, a painter. In addition, motion blur can serve to soften an image by adding diffusion.

Diffusion, Lens Flares and Vignetting

Diffusion is one of the pertaining features in the photographic pictorialism associated with the journal *Camera Work*, funded by Alfred Stieglitz to establish photography as a fine art. In the 'soft style', the blurred image quality soaked the photographs in a dreamlike, surreal bath of heavily diffused light. Diffusion was introduced in photography and especially in portrait photography before the advent of film to emulate a painterly style, which was deemed more artistic, and to enhance the beauty of the women portrayed.

Starting with films like *Broken Blossoms* (1919), this style was embraced by cinematography. In Classical Hollywood, even in movies featuring a crisp deep-focus style, the close-up of the female star was usually embellished with soft diffusion, which could be produced by placing a special type of silk stocking in front of the lens or by applying thin layers of grease directly to it. Cinematographer Henry Alekan kept his black Dior silk stocking for decades, because he relied on its especially beautiful diffusion capabilities, up until the shooting of one of his last films, *The State of Things* (1982).

Most often, diffusion was combined with a blooming highlight produced by backlighting and with shallow depth-of-field. A scene from Josef von Sternberg's film *Blonde Venus* (1932), photographed by Bert Glennon, is emblematic of this style. It is no coincidence that the star, Marlene Dietrich, had to smoke to enhance the diffusion effect. Costume designers and art directors chose fabrics and materials with a beautiful shimmery look such as the sequins on Dietrich's fan. Diffusion has a long-standing tradition in painting to which the pictorialists were referring. For instance, Leonardo Da Vinci invented a certain kind of diffusion called *sfumato*, achieved by adding thin layers of whitish glaze to oil paintings. This technique had a softening



Shallow depth-of-field and diffusion in *Blonde Venus* (1932); the soft look of *Sky Captain and the World of Tomorrow* (2004)

effect and lent depth to the landscape by creating a hazy, misty atmosphere. At the same time, the figure in the foreground is separated from the background and thus gains more presence, with the viewer's gaze directed to the more detailed and sharper areas of the image.

Like the randomly distributed grain, diffusion works against the overly sharp look of CGI. With photochemical stock there is, intrinsically, a slight diffusion. It stems from the silver halide

Vignetting with matte in *Das Cabinet des Dr. Caligari* (1920)

crystals in the emulsion. When the light enters the film stock, it gets more and more diffused, primarily in the red-sensitive layer at the bottom. *Sky Captain and the World of Tomorrow* (2004), a film shot in a completely computer-generated environment, establishes a phantasmagoric 1940s look. In the history of film, this combination of soft style, colours and diffusion never existed, since Technicolor – the dominant colour system at the time – strictly avoided optical diffusion, but nevertheless it is beautiful and perfectly serves its purpose in evoking a period style.

Lens flares are surely the most widespread analogue artefact in CGI. As early as 1999, author Terence Masson called them a cliché in computer graphics. In fact for several years, they acted like flags, indicating the computer origin of the images, which seems ironic given that they were introduced with the opposite effect in mind. When utilised carefully, lens flares can contribute to the aesthetics of CGI in a convincing fashion; they imply the presence of a camera because lens flare originates from internal reflections in the lens. On the image's surface they act as a suturing device which fuses different image parts in compositing. And finally they can trigger associations either with a sunny, southern feeling or with a dark noir style when created by head- or searchlights.

The term vignetting describes the decrease in brightness towards the edges of the frame. It is an effect that formerly occurred with the use of mainly wide-angle lenses and is therefore associated with older films. In a still from *Das Cabinet des Dr. Caligari* (1920), the vignetting effect is enhanced with a matte. As cinematographer Tom Fährmann reported in an interview, vignetting is now routinely added to films because modern lenses are so even in their rendition of brightness that it has become necessary to guide the viewer's gaze towards the centre of the frame, and also to add to the cohesive impression of an image. For his 'artificial reality' in *Moulin Rouge!*, Baz Luhrmann combined vignetting with dust and scratches. Together with the breathless moves of the virtual camera, these artefacts contributed to an ambiguous effect situated somewhere between historicity in a style inspired by Georges Méliès, and an aesthetics of postmodern pastiche.

Functional Typology of Analogue Artefacts in VFX

To adjust CGI to the viewer's expectations in the cinema – or in short to emulate a film look – is certainly the primary reason for the incorporation of analogue artefacts into CGI and compositing. Often CGI is perceived as too 'perfect', but instead of labelling it as perfect, I would rather discuss the topic from the perspective of complexity. For a long time, images tended to seem too carefully composed, and this lack of complexity threatened and continues to threaten their aesthetic value. In 1974, the psychologist D. E. Berlyne conducted an empirical study to investigate the relationship between complexity and a viewer's appreciation based on the hedonistic value (the measurable pleasure felt by the spectator) of an artwork. When an artwork lacks complexity, it evokes – according to Berlyne – little hedonistic value. However, this value increases with complexity up to an optimal point. When the complexity is experienced as being too dominant – or to put it differently, confusing and chaotic – the hedonistic value decreases. These results explain why CGI is expected to offer a certain amount of complexity.

Art historian Gottfried Boehm introduced the term 'aesthetic density' to describe a similar concept. Imperfections, based on analogue artefacts, enrich the image with textures and

deviations, thus densifying the visual impression. As I have noted in my reflections on a theory of representation of CGI, model-building based on mathematical algorithms leads to a lack of randomness in compositions. Obviously many practitioners – directors and visual-effects artists – are aware of this interrelation. Among others, James Cameron advised his visual-effects team during the production of *Terminator 2: Judgment Day* (1991): 'Don't think of yourselves as Industrial Light and Magic, think of yourselves as Industrial Light and Dirt.'[19] On *Moulin Rouge!*, Baz Luhrmann 'wanted the visual effects to have a handmade feel, to hark back to those olden days rather than be seamless in terms of their digital perfection',[20] while Lars von Trier, according to his long-term collaborator Peter Hjorth, had the label 'Make mistakes!' attached to his monitor.[21] Wherever possible, these film-makers were trying to work against the cleanliness and orderliness of CGI.

In addition to these basic explanations, my research has identified the following functions of analogue artefacts in visual-effects-driven movies:

/// They help to create *aesthetic coherence* in compositing, integrating the image parts from different sources seamlessly and in a convincing way.

As mentioned above, when in *Forrest Gump* the protagonist had to be inserted into pre-existing historical documentary footage of famous figures from art and politics, it was necessary to eliminate the artefacts before the compositing could be performed, and reintroduce them afterwards. If these differences between the various image elements were not ironed out, the aesthetic incoherence would attract attention to itself, leading to a change in the mode of perception whereby the image composition would become the subject of reflection. According to the rules of the continuity system in Classical Hollywood film, it was imperative to avoid this kind of inconsistency. Much of the fascination elicited by the playful ironic mode present in *Forrest Gump* can be attributed to the double consciousness at work. The seamlessness of the compositing acts like a perfect magician's trick, where we know that we are viewing an illusion, but are unable to locate the deception, however much we scrutinise the performance. Paul Grainge used the term 'eclectic irony' suggested by Jim Collins to contextualise this effect. These films 'utilise the sophistication of media culture … greeting new forms of textuality by reworking traces of the "semiotic array" in hybrid and ironic combinations'.[22]

As we have seen, attempts to evoke a historical period or indicate a flashback by reproducing earlier technical or aesthetic standards and/or wear and tear like scratches and dirt, date back several decades. Such techniques are often associated with the genre of biopics, and helped to underscore the public significance of the person portrayed, as in Martin Scorsese's *Raging Bull* (1980). In *Le fabuleux destin d'Amélie Poulain* (2001), this tradition is once again inverted to ironic effect when the protagonist watches her own funeral on TV. Such an ironic distancing effect had been lacking in Oliver Stone's *JFK* (1991), where staged footage was introduced side by side with historical sources. While Robert Burgoyne attributes the 'ferocious controversies' surrounding *JFK* and *Forrest Gump* to the use of CGI and 'the seamless splicing together of fictional scenes and archival footage … blurring the boundary between actuality and fiction', I would argue for strict distinctions between these two films.[23] In *Forrest Gump*, as in *Zelig*, there is a comedic element at work that instructs the viewer to doubt the documentary status of the hybrid images.

Due to the lack of such internal inconsistencies as well as of any markers to flag the staged footage as fictitious, such guidelines are missing from *JFK*.

/// They mark different narrative strands in complex patterns to support the viewer's orientation.

The Matrix is the best-known example of a narrative structure that implies a double diegesis differentiated by various degrees of a supposed reality effect. Colour codes and differences in *mise en scène* helped the viewer recognise the different worlds, within and without a computer-simulated reality. With a similar pattern, Mamoru Oshii's *Avalon* (2001) established a scheme based on analogue artefacts in combination with colour codes. At first, the game world is toned in sepia and indicated by heavy diffusion, in part as black halo. Black halo had been a fashion in a certain kind of art reportage photography of the 1970s whereby light diffusion was added in the printing process. However, starting with *Tron* (1982), many films with a narrative scheme similar to that of *The Matrix* exposed the digitality of the alternative, simulated world, thus generating a difference to the filmic material, even when a major part of the simulated world had been shot on film, as with *Tron*, *Virtuosity* (1995) and *Johnny Mnemonic* (1995).

/// They enhance a film's style for artistic reasons, either to deepen the expressiveness of the film or to comment on the film-making process in a self-reflexive manner.

In this case, the CGI emulates the look of analogue film in order to deliver something the viewer would perceive as familiar as well as a filmic experience conspicuously different from his or her everyday perception. It is no coincidence then, that this strategy is mainly applied to science-fiction or fantasy films to underscore their autonomous fictional worlds. A typical example is *Sky Captain and the World of Tomorrow*, which combines a lovingly devised pastiche of film noir elements with a romantic soft-focus style to produce a filmic representation soaked in nostalgia and cinephilia. The sheer quantity of analogue artefacts establishes its postmodern stylisation in creating a fairy-tale world full of mythic allusions. We could relate this strategy to Victor Shklovsky's call for alienation in the representation of an art work. In mockumentaries, a similar style serves another purpose, namely to introduce a different quality in a self-reflexive manner with an ironic or even sarcastic tone.

/// They reinforce the illusion of authenticity by emulating low-resolution footage or blurred and shaky images like those an amateur witness might produce when capturing a scene.

Analogue artefacts have long become markers of authenticity, especially when they involve noise and the breakdown of signals as in a famous scene from *Wag the Dog* (1997). On a blue-screen stage the two protagonists produce a fake documentary about an alleged war in Albania to divert attention from a sex scandal involving the US president. In this satirical tale about media manipulation, artefacts such as screen-lines, noise and dropouts are incorporated to denote a tradition of war reportage in an attempt to simulate authenticity.

Simulation of an 'amateur' look in *War of the Worlds* (2005)

There are a vast number of such emulations of amateur or documentary footage. They are often connected to the framed representation on a television screen such as the surveillance footage in *Enemy of the State* (1998) or the previously mentioned shots gathered by the journalists in *District 9*. By displaying certain clusters of distortions commonly associated with stressful situations or clandestine operations where cameramen risk their lives to shoot the material, they enhance the reality effect. *War of the Worlds* (2005) is a case in point. Its overt allusions to media representations of 9/11 recall a feeling of paranoia. As Bill Desowitz noted of the film: 'The gritty look was inspired by amateur 9/11 footage, with dust and debris falling from the sky, and hand-held shots of pandemonium. ... The vfx shots occur behind smoke, ambience and camerawork.'[24]

Nostalgia, Style and Authenticity

Such widespread replication of the characteristics of film and electronic video stands in sharp opposition to the assumption that media develop towards a completely transparent representation of reality. And I would even contest D. N. Rodowick's assertion that 'technological and creative innovations in digital image synthesis have been driven by a single, though somewhat paradoxical goal: the achievement of "photographic realism"'.[25] First of all, the phenomena analysed here are highly mediated transformations of the current state of the art in photography. They do not aspire to the standards of professional technologies, but rather display earlier or low-tech approaches to photography. Second, there have always been different strands in computer-generated imagery such as non-photographic renderings in animated films, computer games and many more applications outside the entertainment industry, i.e. scientific visualisations. In turn, such visualisations can become part of fictional narrations to denote a scientific approach to fictitious objects or events, as in science-fiction films where imaginary inventions are rooted in some pseudo-scientific explanations. For instance, in *Avatar* (2009), not only the world in Pandora, but the function of the Avatars themselves is explained

and backstoried, or in *Inception* (2010), where the highly subjective experience of the protagonists is continually explained to the audience.

Photorealism is but one possible outcome in this development and a majority of the several hundred films that I have analysed in the course of my research show a variety of strategies, even to the point where discontinuities are deliberately highlighted rather than subsumed in seamless integration. Generally, technological developments tend to seek to showcase their achievements. If these achievements were dissolved in perfect photorealism, so that the viewers would no longer notice them nor distinguish them from ordinarily captured film, much of the fascination would be lost. Many of my investigations into technological changes have shown that this downplaying of innovations only happens when a new technology is fully mastered. Based on my analyses, this phase began only recently, with films like *The Kite Runner* (2007), *United 93* (2006) or *Children of Men* (2006).

Apart from the functions described in the preceding pages, there are more general aspects located in culture and society to discuss to eventually explain the phenomena of exposed cinematic artefacts in CGI. In the wake of Fredric Jameson's critical notions of postmodern culture in late capitalism, nostalgia and pastiche were two of the most debated concepts in the last decade. In Jameson's reflections – that are by themselves highly nostalgic for a bygone era – he contrasts the sincerity of high-modernist culture to the 'waning of affect in postmodern culture', in which 'modernist styles ... become postmodernist codes' and produce 'a field of stylistic and discursive heterogeneity without a norm'. He associates the 'nostalgia film' with the concept of '"historicism" ... the random cannibalisation of all the styles of the past, the play of random stylistic allusion'.[26] Jameson's highly influential analysis concludes that nostalgia is yet another commodity governed by capitalist laws.

In his investigations into the use of black-and-white cinematography in contemporary films, Paul Grainge identifies the 'retro style' that 'has become a term used to describe the past as it is figured within style narratives of the chic and trendy ... playful, ironic, and where the past is a storehouse of fashion'.[27] It is a mode infused with an atmosphere of 'pastness'. Many scholars associate this resurgence of pastness with the 'death of cinema', a cultural change from the once analogue mode of production, with the cinema as the locus of exhibition, to a hybrid or fully digital version of 'what was cinema',[28] with a multitude of scattered displays now replacing what had been the cinematic experience. The currently fashionable retro mode in the smartphone apps, Hipstamatic and others, fit into this explanation in that they connect a vernacular culture of easy snapshot photography to a tradition that was once charged with a higher value reserved for special moments in family life such as holidays and weddings. Moreover, in the case of cinema, there is the specific cultural tradition of fandom, termed cinephilia, which, as Benson-Allott suggests, is at the very foundation 'to create a transhistorical cinematic mythology' and 'a celluloid affect'.[29]

Pastiche, however, is not a practice restricted to postmodernism, nor to cinema, nor to nostalgia. As Gérard Genette in *Paratexts*[30] and Richard Dyer in *Pastiche* point out, it has a long-standing tradition in art, literature and in many other cultural practices. 'The word itself comes from Italian "pasticcio" ... which, in its earliest recorded use, meant a pie ... .The idea of a mixed dish – meat and/or vegetables plus pastry – was then applied to art.'[31] Based on this etymological definition, Dyer differentiates between 'pasticcio-pastiche' to denote a combination of

means[32] and pastiche in the sense of imitation which is 'unconcealed',[33] 'textually signalled' and 'evaluatively open'.[34] Genette refers only to the latter meaning, but distinguishes it from parody, travesty and persiflage in assigning the pastiche the role of a more lovingly playful form of imitation restricted to style.

Style in this conception can be considered as independent of the content, that is, as an intertextual and transtextual tool to tell or show something new in a fashion borrowed from earlier artworks. With the concept of pasticcio-pastiche we have a theoretical framework to understand the highly hybrid mode that characterises the strategies described and analysed in the previous sections.

Beyond being a purely transtextual strategy, the dislocation and reappropriation of stylistic features across historical and medial boundaries creates a specific form of meaning. It is with (semio-)pragmatics, established by Roger Odin[35] and further developed by Frank Kessler and William Uricchio, that we can investigate this transformation of style from an autonomous feature of filmic artworks to a signifier in its own right. In his reflections on a definition of the documentary, Odin elaborates how the documentary is essentially a mode of communication highly informed by the institutional framing both of the production and the sociocultural space of consumption which informs the spectator how to 'read' a film. This entails extratextual information as well as internal signals such as credits, but also stylistic features that call upon the spectator's intertextual knowledge to interpret specific bundles of textual properties as indicating a nonfiction film. Noël Carroll defines this extratextual framing as index: 'When a film is indexed as nonfiction then we know that it is appropriate to assess it according to the standards of objectivity of the field of which it is an example.'[36] In the words of Odin, the documentary mode produces an 'authentic effect'.[37]

Following this line of theoretical reasoning, we can understand the reappropriation and recontextualisation of material and stylistic properties from historical, documentary or amateur footage in fiction films as a transposition from style to meaning. The style references a specific production/consumption mode and transposes it onto a different film. A typical case of this strategy is the mockumentary, where the stylistic features of a documentary are applied to a fiction film. It is precisely the accumulated, exaggerated and exposed artificiality that is typical of all the films discussed here, that provokes an ironic, self-reflexive stance and enables this playful merging of a variety of allusions and quotations. 'Authenticity' in this context is not meant to be a category to be evaluated in the framework of truth or fakery, but a sheer effect that puts any reality represented in the media into question.

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Notes

1. Baz Luhrmann, quoted in Joe Fordham, 'Paris by Numbers', *Cinefex* no. 86 (2001), p. 16.
2. Barbara Flückiger, 'Zur Konjunktur der analogen Störung im digitalen Bild' [On the Boom of Analogue Imperfections in Digital Images], in Alexander Böhnke and Jens Schröter (eds), *Analog/Digital – Opposition oder Kontinuum? Beiträge zu Theorie und Geschichte einer Unterscheidung* (Siegen: Transcript, 2004), pp. 407–28; *Visual Effects: Filmbilder aus dem Computer* (Marburg: Schueren, 2008).

3. Computational photography captures images in connection with data that allow their transformation based on a series of images or on the recording of a light field.
4. See D. N. Rodowick, *The Virtual Life of Film* (Cambridge, MA and London: Harvard University Press, 2007), p. 94.
5. William J. T. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-photographic Era* (Cambridge, MA: MIT Press, 1992).
6. Wolfgang Ullrich, *Die Geschichte der Unschärfe* (Berlin: Klaus Wagenbach, 2002).
7. Turner Whitted, 'An Improved Illumination Model for Shaded Display', *Commun. ACM* vol. 23 no. 6 (1980), pp. 343–9.
8. A shader describes a surface's reaction to incident light. The Phong shader was an early example. It was comprised of a term for the colour of an object, one for the glossy reflection and another one for ambient light. With these properties it generated the look of plastic.
9. Caustics are a pattern of light as seen on the bottom of a swimming pool or below a glass. It is created by internal reflection and refraction.
10. Nelson Goodman, *Languages of Art* (Indianapolis, IN: Hackett Publishing Company, 1976 [1968]); *Ways of Worldmaking* (Indianapolis, IN: Hackett Publishing Company, 1990 [1978]).
11. Goodman, *Languages of Art*, p. 37.
12. Janusz Kaminski, quoted in Jay Holben, 'Criminal Intent', *American Cinematographer* vol. 83 no. 7 (July 2002), p. 35.
13. See http://store.kodak.com/store/ekconsus/en_US/html/pbPage.termsT/ThemeID.16765600.
14. Kaminski, in Holben, 'Criminal Intent', p. 36.
15. Caetlin Benson-Allott, '*Grindhouse*: An Experiment in the Death of Cinema', *Film Quarterly* vol. 62 no. 1 (Fall 2008), pp. 20–6.
16. Post-processing is applied to CGI after the rendering.
17. Ron Brinkmann, *The Art and Science of Digital Compositing* (San Diego, CA: Morgan Kaufmann, 1999), p. 233.
18. Stephen Prince, 'The Emergence of Filmic Artefacts: Cinema and Cinematography in the Digital Era', *Film Quarterly* vol. 57 no. 3 (Spring 2004), p. 32.
19. James Cameron, quoted in Jody Duncan, 'A Once and Future War', *Cinefex* no. 47 (1991), p. 33.
20. Joe Fordham, 'Paris by Numbers', *Cinefex* no. 86 (2001), p. 16.
21. Peter Hjorth, 'The Development of Shooting Concepts from *The Celebration* to *The Boss of It All*', in Andreas Kirchner *et al.* (eds), *Abschied vom Zelluloid? Beiträge zur Geschichten und Poetik des Videobildes* (Marburg: Schueren, 2008).
22. Paul Grainge, *Monochrome Memories: Nostalgia and Style in Retro America* (Westport, CT: Praeger, 2002).
23. Robert Burgoyne, 'Memory, History and Digital Imagery in Contemporary Film', in Paul Grainge (ed.), *Memory and Popular Film* (Manchester and New York: Manchester University Press, 2003), p. 222.
24. Bill Desowitz, 'War of the Worlds, A Post 9/11 Digital Attack', *VFXWorld*, 7 July 2005, http://www.awn.com/articles/production/iwar-worldsi-post-911-digital-attack-0.
25. Rodowick, *The Virtual Life of Film*, p. 101.
26. Fredric Jameson, *Postmodernism, or, the Cultural Logic of Late Capitalism* (London: Verso, 2001), p. 17.
27. Grainge, *Monochrome Memories*, p. 54.

28. Rodowick, *The Virtual Life of Film*, p. 25.
29. Benson-Allott, '*Grindhouse*', p. 22.
30. Gérard Genette, *Paratexts* (Cambridge: Cambridge University Press, 1997).
31. Richard Dyer, *Pastiche* (London: Routledge, 2007), p. 8.
32. Ibid., pp. 9–21.
33. Ibid., pp. 21–5.
34. Ibid., p. 24.
35. Roger Odin, 'For a Semio-pragmatics of Film', in Warren Buckland (ed.), *The Film Spectator: From Sign to Mind* (Amsterdam: Amsterdam University Press, 1995 [1983]).
36. Noël Carroll, *Theorising the Moving Image* (Cambridge: Cambridge University Press, 1996), p. 232.
37. Odin, 'For a Semio-pragmatics of Film', p. 221.